Forest Service

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Subject: Wagon Tire / MC Canyon Juniper Project, Prescott NF

To: District Ranger, Bradshaw RD, Prescott NF

On July 2, 2008, at the request of Kurt Wetzstein, Forester on the Prescott NF, I visited the Wagon Tire / MC Canyon Juniper project area to evaluate possible cause of juniper mortality within the area. This letter describes my observations and a brief description of the possible tree mortality agents.

Existing conditions

Large groups of one-seed juniper (*Juniperus monosperma*) mortality were observed in units 770 and 697 southeast of Drake, AZ. Live juniper within these units showed various stages of decline, presumably from drought stress, figure 1. Most juniper mortality was older (2-3 years) with few recent or currently fading trees. Removal of bark from dead trees revealed old egg galleries and feeding galleries of both *Phloeosinus* bark beetles and western cedar borers.

Figure 1. A range of juniper health at the Wagon Tire / MC Canyon project within unit 770 and 697. Drought conditions are causing tree stress such that bark beetles and borers can cause branch die back and tree death. In some cases drought related stress is causing tree mortality.

Insect biology and description

Phloeosinus bark beetles are a little-studied species. As a general rule these beetles are not aggressive tree attackers and are found working under the bark of trunks, tops, and limbs of weakened, dying, or felled trees. Some species will feed in twigs as young adults before emerging to attack larger branches and the bole. Occasionally they become sufficiently numerous and aggressive to attack and kill apparently healthy trees. In general, *Phloeosinus* is thought to have between one and 1.5 generations per year with attacks occurring in the spring and summer.

The western cedar borer also attacks weakened, dead, and recently felled trees. It can be an aggressive pest in drought-stressed junipers and cypress. Usually large portions or the entire tree dies before the insect is detected. The larvae bore first in the cambium region of the trunk, branches, and roots, then often penetrate the wood, sometimes mining it extensively for a number of years figure 2. The flattened oval wormholes are tightly packed with boring dust. Typically the adults form in the fall and emerge the following spring.

Figure 2. Western cedar borer mining in juniper branch.

Outbreaks of either of these insects are typically triggered by moderate to severe extended periods of drought. The duration of an outbreak is usually 1-3 years. High tree densities can exacerbate an outbreak.

Treatment options

Preventative treatments are the best long term approach for minimizing impacts from forest insects. By maintaining healthy, vigorous trees insect attacks can be reduced. There has been little work done related to juniper health and insect attack, however there has been work in pinyon/juniper woodlands that might be relevant. Negron and Wilson (2003) recommend thinning the pinyon component to reduce the potential for Ips beetle attack to a total stand density index (SDI) <50. Where stands are composed of mixed pinyon and juniper, a total SDI of <60-70 may be appropriate. This SDI level should maintain the site in tree cover (provide aerial cover and root mass to protect soils) but still open the canopy sufficiently to allow understory species to increase or become established in the canopy gaps. Debris from cut trees may be scattered in created openings to enhance soil protection and provide for microsite protection for establishing vegetation. To maintain diversity, trees selected to be retained should be of good form and vigor, of various size/age classes, and be a mix of tree species when available (Page 2008). Additional study is needed to determine optimal SDI levels to minimize impacts from drought induced attacks from *Phloeosinus* beetles or wood borers, however reducing stand density, increasing size diversity and species composition has shown to be an effective means at reducing beetle impacts in other tree species.

If you have any questions regarding this site visit please contact me at (928) 556-2073.

/s/ John Anhold
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Arizona Zone Leader Forest Health

cc: Kurt Wetzstein
Joel McMillin
Alan Quan
Debra Allen-Reid
References Cited:

Negron, Jose F., and Jill L. Wilson. 2003. Attributes associated with probability of infestation by the pinon *Ips, Ips confusus* (Colioptera: Scolytidae), in pinon pine, Pinus edulis. Western North American Naturalist 63(4): 440-451.

Page, Douglas H. 2008. Preliminary thinning guidelines using stand density index for the maintenance of uneven-aged pinyon-juniper ecosystems. In Review.